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ABSTRACT

Under a grant from the National Science Foundation, Bakersfield College (BC) conducted a project designed to provide science and social science faculty with opportunities to learn how to develop instructional computing materials and to assess and adapt others' materials for their own use. The three phases of the project were: (1) workshop organization and participation selection, which involved meetings with validation team members, site visitations, attendance at meetings and seminars on computing and computer-assisted instruction by project staff, preparation of instructional materials, equipment and software purchases, facilities renovation, employment of additional project personnel, selection of 30 participants from 22 colleges, and preparation of evaluation materials; (2) a 4-week summer seminar on computer-assisted instruction, focusing on topics such as computer hardware and software, the BASIC programming language, computer graphics, and the future of instructional computing; and (3) on-site visits to the campuses of workshop participants to assess progress and provide assistance, and a follow-up seminar. All of the project participants submitted a report on the activities initiated as a result of the workshop and those who were able to try their materials in learning situations gathered student responses to their materials. The project report includes summaries from each of the workshop participants which describe the materials developed. (HB)

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INSTRUCTIONAL COMPUTING IN THE COMMUNITY COLLEGE

Project Report

Robert D. Allison
Bakersfield College
September 21, 1982

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INSTRUCTIONAL COMPUTING IN THE COMMUNITY COLLEGE

Project Report
Robert D. Allison

September 21, 1982

A four-week workshop on computer assisted instruction for community college instructors was held at Bakersfield College from 15 June to 10 July, 1981. It was sponsored by Bakersfield College and the League for Innovation in the Community College. Funding for the workshop, which amounted to approximately $190,000, was obtained from the Comprehensive Assistance to Undergraduate Science Education (CAUSE) program of the National Science Foundation and the Kern Community College District.

Workshop participants consisted of science and social science faculty from 22 League colleges. Their disciplines included biology, chemistry, physics, engineering, mathematics, geology, geography, psychology, political science, and sociology.

Workshop instructors, all Bakersfield College faculty, included: Dr. Robert D. Allison, Project Director and Chairman, Physical Science Department; Olin C. Kirkland, Director of the Instructional Computer Center; and Stephen D. Smith, Associate Professor of Economics and Computer Technology. The instructors were assisted by four teaching assistants, Don Krause, Dean Miller, Cherie Mitchell, and Carol Nystrom.

In their National Science Foundation grant application, Allison, Smith, and Kirkland state: It is our opinion that the effective application of the computer to instruction currently requires faculty who are knowledgeable enough to:

1. Develop their own materials when necessary.
2. Assess the potential usefulness of others' materials to their own needs.
3. Adapt and modify others' materials to be effective teaching tools in their own classrooms.

The project's major purpose was to give a representative group of science and social science faculty time to learn how to develop instructional computing materials, the background needed to obtain such materials from others, and the training required to allow them to adapt the materials to their own and their colleagues' teaching situations and computer systems. It is anticipated that this training will lead to expanded instructional computer use in the participants' institutions, by both participants and others. As they demonstrate how instructional computing can be applied effectively in their class situations, the interest of other faculty (and students) will be aroused, and such use will spread. The result will be the kind of improvement in science education which CAUSE was established to promote.

The project included 3 phases, as described below.

Phase 1 - Workshop Organization and Participant Selection

This phase, begun in September 1980, consisted of a number of activities.

1. Meetings with validation team members

The project consultants were visited by the workshop instructors during Fall 1980. The goals and methods of the workshop were discussed, and the consultants offered their opinions and suggestions, a number of which were adopted. The consultant meetings took place at the following places and dates.

Consultant	Meeting Place	Date
Jack A. Chambers	Fresno State University	10-16-80
Perry Edwards	Sierra College	10-17-80
Wade Ellis, Jr.	Gavilan College	10-24-80
Herbert D. Peckham	Gavilan College	10-24-80

2. Site Visitations

Some visits to other sites at which CAI development work is being done were made, usually in conjunction with a trip being taken for another purpose (meeting, consultant visit). These included: Center for Information Processing, California State University, Fresno; Sierra College, Mills College, Xerox Palo Alto Research Center; Gavilan College, and Santa Rosa College.

3. Meetings and Seminars

One or more of the project staff attended meetings concerned with the state of the art in computing and computer assisted instruction, partly in preparation for the summer workshop. These included:

Meeting	Date	Attended by
National Educational Computing Conference Norfolk, VA	6-23,25,1980	Allison
Directors of CAUSE computer-related projects Atlanta, GA	10-2,3,4,1981	Allison
California Educational Computing Consortium San Diego, California	11-20,21,22,1981	Allison Kirkland Smith
California Educational Computing Consortium Santa Cruz, California	3-26,27,1981	Allison Kirkland
Northern California Community College Computer Consortium Santa Rosa, California	10-25-80	Allison Kirkland Smith
Computer Currency Seminar, Pomona, CA	3-16-81	Allison Kirkland

4. Preparation of Instructional Materials

Course materials for the workshop were in the process of preparation throughout the academic year preceding it. The project staff met weekly to discuss both practical and philosophical aspects of materials development and workshop organization. During these discussions, the guest speakers to be invited to give presentations to the workshop were decided upon.

5. Equipment and Software Purchases

Four microcomputers (2 Apple II's, a TRS 80 Model I, and TRS 80 Model III were purchased for the workshop. In addition, Science Research Associates loaned five Atari 800 microcomputers to the project.

Exemplary CAI software from a wide variety of fields was available for examination and use by project participants. Some of this software was purchased with project funds, some was obtained free from a number of sources, and some was written by the project instructors.

6. Facilities

The remodeling of a room and the installation of auxiliary air conditioning units was completed before the workshop began. This allowed adequate space for workshop activities and 7 day per week use of those facilities. All of this was done using local funds.

7. Project Employees

In addition to the project instructors, 6 employees were hired. Two worked as programmers in preparation for the workshop. These were joined by 2 more to serve as programmers and teaching assistants during the workshop. Finally 2 employees acted as night and weekend operators in order that the computer center could be kept open for the participants.

8. Participant Selection

Thirty natural science and social science faculty were selected by the workshop instructors to be participants. The selections were made from a pool of approximately 125 applications. To be selected, participants were required to demonstrate their potential for benefiting from the workshop experience. Only full time instructional staff from these colleges which are members of The League for Innovation in the Community College were considered for acceptance.

9. Project Evaluation

Instruments for evaluation of the workshop by participants and of CAI materials by students were prepared.

Phase 2 - The Summer Workshop

The workshop covered a wide variety of topics related to computer assisted instruction. These included: computer hardware and software; review of BASIC programming; scope, design, and development of CAI materials; sources of CAI courseware; learning principles applied to CAI; advanced programming topics; the problems of transferring computer materials; an introduction to Pascal; microcomputers and their role in CAI; computer graphics; selection of computing equipment; computer managed instruction; and the future of instructional computing. The treatment of almost all of these subjects included lectures, demonstrations, and laboratory exercises.

Although most of the material was presented by the project staff, a few topics were covered by invited speakers. These speakers included Alfred Bork, University of California, Irvine; Arthur Luehrmann, Computer Literacy; Herbert Peckham, Gavilan College and Computer Literacy; Perry Edwards, Sierra College; and Renato Colantoni, Los Angeles City College. In addition, representatives from Radio Shack, IBM, Digital Equipment Corporation, and Science Research Associates/Atari gave presentations to the participants.

Early in the workshop the participants were asked to begin to think about the CAI courseware which they were going to develop as workshop projects, and to discuss their ideas with the workshop faculty. By the end of the third week, most participants were ready to begin work on their projects, and the fourth week was devoted almost solely to project work.

It appears that the workshop was a success. The participants were enthusiastic and very hard working. Many returned to their institutions with developed courseware. Others made substantial beginnings and expected to be using the computer in instruction for the first time in the ensuing year. More importantly, virtually all participants now understand how the computer can be effectively used in their instructional fields and feel that they are competent to create courseware for such use.

The workshop evaluation, completed by participants during the last two days of the workshop, indicated that the objectives of the workshop were fulfilled and that it was a very worthwhile experience. This was substantiated by many favorable verbal comments as well as a dinner given by the participants in honor of the workshop staff during the last week.

Phase 3 - On-site Visits and Followup Seminar

During January and February of 1982 Allison and Smith visited some of the workshop participants at their colleges. The purpose of these visits was to assess progress and to offer help if needed. The visits and their dates follow.

Institution	Date
Richland Community College	January 18, 1982
North Lake Community College	January 18, 1982
El Centro Community College	January 19, 1982
Johnson County Community College	January 20, 1982
Phoenix Community College	February 18, 1982
Scottsdale Community College	February 19, 1982

Of course, consultations with the workshop participants from Bakersfield College took place throughout the year.

The followup seminar for the workshop participants was held on 27 and 28 March 1982 at the Kellogg West Center for Continuing Education on the campus of California State Polytechnic University, Pomona.

The seminar was attended by 28 of the 30 original participants, the workshop director, Robert Allison, workshop staff members Olin Kirkland and Stephen Smith, and 2 of the 4 workshop teaching assistants, Cherie Mitchell and Carol Nystrom.

The structure of the seminar primarily consisted of presentations by participants of their activities in the development and implementation of computer assisted instructional materials since the workshop last summer. Considerable discussion was held, both in formal sessions and informally, and there was ample opportunity for exchange of ideas and materials.

The progress made by the participants was very impressive. Almost all had developed materials which were or would soon be in classroom use. The materials represented a range of CAI applications, from tutorial to drills to testing. Some of the projects were of considerable scope, especially for the relatively short time since the workshop last summer. Of course, some difficulties were described, but they were (usually) minor compared to the accomplishments demonstrated. Those who had used CAI in instruction reported very good results.

Because the members of the group are interested in keeping in contact with each other, a newsletter is to be established for that purpose. It is to be edited by Olin Kirkland.

It was obvious that the sense of accomplishment felt by the participants was both great and well-deserved.

Project Summaries

All of the project participants submitted a report on the activities initiated as a result of the workshop. In many cases, the progress made was substantial, and actual student reaction to developed materials is available. In other cases, student use is only now beginning. In a few cases materials development has been hindered because of lack of facilities for such development.

Those who were able to try their materials in learning situations gave their students a questionnaire. A summary of the questionnaire results follows.

1. Materials have been or are in the process of being developed for instruction in:

Biochemistry	Engineering	Physical Education
Biology	Geology	Physiology
Chemistry	Mathematics	Political Science
Computer Science	Medical Terminology	Psychology
Economics	Physics	Sociology

2. Type of CAI application

Type	Number of Student Respondents
Simulations	3
Laboratory data/calculation check	3
Tutorial	101
Drill and practice	70
Other	84

3. What was learned through use of computer

Type of learning	Number of Student Respondents
Concepts	130
Problem solving and calculations	18
Facts	135
Familiarity with computers	139

4. Recommendation for future applications of CAI

Application Type	Use*	
	More	Less
Simulations	39	1
Laboratory data/calculation check	2	1
Computer quizzes	47	
Drill and practice	8	1
Computer homework	35	1

*Number of student respondents

5. Approval of instructional computer use

Extent	Number of student respondents
Very much	102
Somewhat	28
Not at all	2
Unsure	2

6. Benefit to learning

Extent	Number of student respondents
Great benefit	81
Some benefit	2
No benefit	7
Unsure	2

7. Approval of CAI in general

Extent	Number of Student Respondents
Very much	90
Some	39
Not at all	5
Unsure	2

SUMMARIES OF PARTICIPANT REPORTS

John Ackland
Bakersfield College
1801 Panorama Drive
Bakersfield, CA 93305
(805) 395-4401

Description of materials

The purpose of this program is to keep a data bank of anatomical and physiological information concerning each person taking a battery of physical fitness tests. It also performs the necessary calculations to determine test result data that is to be stored.

It is intended for use in the Physical Fitness Assessment class at Bakersfield College.

Author

William Lawhead, student assistant, Bakersfield College

Technical Description

The program was written in BASIC Plus for the DEC PDP 11/70 running under the RSTS/E operating system.

Implementation

None to date

Lela Jean Alvers
Johnson County Community College
12345 College Blvd.
Overland Park, KS 66210
(913) 888-8500

Description of materials

Program: Advanced Statistical Analysis (ASA)

This is a data analysis system for describing data sets and conducting statistical data analysis. It can be used in most situations requiring preliminary analysis of small amounts of data.

The program is designed for use by staff and students in such discipline areas as statistics, psychology, sociology, political science, business courses, methodology and in experimental research applications. It includes 10 programs for describing data sets and conducting statistical data analyses; 2 utility programs for preparing, updating, and listing data files; and a program to aid in selecting data samples. The programs can be run with little formal knowledge of data analysis techniques and no knowledge of computer programming.

Authors

Jean H. Alvers, Modifications and Alterations
Stephen W. Hebbler, Ph.D., Original author
(source: Radio Shack, Fort Worth, TX 76102)

Technical description

ASA is designed for use on the Radio Shack TRS-80 Microcomputer, Model I and requires 16K RAM and Level II ROM. The program is greatly enhanced by the use of a disk drive, disk BASIC, and a line printer.

Program: ROLODEX

This program will create, access, and alter the various types of information that would normally be found in a conventional desk-top rolodex file. Suggested uses include mailing lists, AV/video tape listings, directory information, membership data, and address files.

Author

Jean H. Alvers

Technical description

The program is designed for use on a Radio Shack TRS-80 Version 2.0, one disk drive, and an Epson MX-80 printer. The program occupies 3,700 bytes of memory and the additional usage of 23,101 bytes of memory. The data file is accessed from the disk. The program relies on Apparat's expanded BASIC plus Radio Shack's BASIC ROM. This program creates its own separate data file that can be accessed by other programs.

Implementation

Course usage: Social Psychology
Child Development

Number of Student Users - 130 (ASA) - Spring 1982

Student time spent using materials: No data available
(hours/student/week)

Notes:

Social Psychology students seemed better able to assess research reported in the popular press and were more effective in their ability to discriminate among strategies of research that best fit the situational problem, and to recognize and use measurement and statistics.

The program allows an instructor to deal with statistics conceptually and leave the necessary mathematical calculations to the computer.

The ROLODEX program is a very effective time-saver.

Virginia Buckner
Johnson County Community College
12345 College at Quivira
Overland Park, KS 66210
(913) 888-8500

Description of materials

The program is composed of two parts. First, an example of a monohybrid cross is given. In the second part of the program, the computer selects at random one set of parents out of 10 possible sets, and the student must determine the gametes, offspring and the 2 ratios. For each input opportunity, an attempt has been made to anticipate all possible incorrect responses and to give a response which will indicate the type of error.

This program is to be used as a tutorial and not as a test for college students in an introductory biology course.

Author

Virginia Buckner (and sons)

Technical description

Apple computer

Implementation

The program was not complete at the time of this report.

Mary Jane Burge
Donald Wheeler
Cuyahoga Community College
2900 Community College Avenue
Clevland, OH 44115
(216) 241-5966

Description of materials

Package: Hear and Spell

Programs in Package:

SPSKEVOC.128	SPALIMEN.128
SPAPPEN1.128	SPDIGETC.128
SPAPPEN2.128	SPHEART.128
SPAXIAL.128	SPVEIN.128
SPMUSVOC.128	SPARTERY.128
SPMUSCLE.128	

The Hear and Spell "driver program" can be used to create programs that can be used in any course, at any grade level, which require drill and practice in spelling.

The programs in this package are designed for use by college students enrolled in Anatomy and Physiology, which is a prerequisite course for the nursing and allied health majors. These are audio-visual drill and practice programs for the spelling of anatomical terms relating to the skeletal, muscular, digestive and cardiovascular systems.

This package has been developed as an aid to students who wish to determine their level of spelling accuracy prior to taking their in-class lab practical exams.

Techincal Description

The programs are written in Atari BASIC and run on Atari 800/400 microcomputer with 32K memory, and an Atari 410 recorder. The programs are approximately 185 statements in length.

Program: QUIZ

The QUIZ program can be used in any course, at any grade level, which requires drill and practice. It allows the student to review subject material in a testing format. The computer turns the tape recorder on, which presents a question on the material. The program allows questions requiring 1 to 4 answers. If the student responds incorrectly, she/he has the option either to try again immediately or to see the answer(s) before making another attempt. If the student chooses to see the correct answer(s), the answer(s) will be presented in color graphica. The program will accept answers in singular or plural forms, as well as responses containing extra words. Multiple answers can be entered in any order.

This particular program has been designed for use by college students enrolled in Anatomy and Physiology which is a prerequisite course for nursing and allied health programs. This is an audio-visual drill and practice program over questions based on the performance objectives for lecture material. Questions are presented through the auditory mode (a peripheral Atari 410 recorder) and the student responds via the terminal keyboard.

Technical description

This program is written in Atari BASIC and run on an Atari 800/400 microcomputer with 32K memory, an Atari 810 disk drive, and an Atari 410 recorder. This program is approximately 800 statements in length.

Program: TUTOR

TUTOR is an audio-visual presentation of lecture material followed by a computer controlled audio presentation of questions. It can be used in any course, at any grade level, to either present new material or as a review of lecture material.

This program is presently being used by college students enrolled in Anatomy and Physiology. Lecture material covering a set of objectives is presented followed by a set of questions based on the performance objectives for lecture material.

Lecture material is presented in outline form on the monitor screen concurrently with a descriptive audio presentation. The program contains automatic stops after each new concept or definition which allows for self-pacing and note taking. After the tutorial portion of the program, the students are asked questions through the auditory mode (a peripheral Atari 410 recorder). If the student input response is incorrect, answers are presented via the visual mode in color graphics.

Technical description

This program is written in Atari BASIC language and run on an Atari 800/400 microcomputer with 48K memory, an Atari 810 disk drive, and an Atari 410 recorder. This program is approximately 800 statements in length with inserts varying from 5 to 200 lines.

Audio tapes were made using a stereo cassette recorder (Toshiba RT-8155S). Tone control of the tape by the computer was put on one audio track and voice on the second audio track. Floppy disks were used to allow students random access of material. With each random selection, the students will get instructions as to what tape to use and at what footage position to begin.

Program: BIO128

This is a self-tutorial drill and practice program with the added feature of allowing students to choose particular material they would like to review. It is designed for college students enrolled in Anatomy and Physiology which is a prerequisite for

nursing and allied health programs. These routines are designed to provide the necessary information to answer the lecture performance objectives and to allow for drill and practice on these objectives prior to in-class exams. For the most part, these questions are fill-ins to emphasize spelling.

Technical description

This program is written in TUTOR language and run on a Cyber 170 Main frame computer. The program consists of 6 files, using a total of 50 blocks with each block equal to 320 words, or 100 lines.

Instructor Notes

There are "Instructions for Teachers" for each of the four programs. The instructions describe what the programs do and what the student/user is expected to do. The equipment needed to run the programs and produce the tapes is also specified along with an explanation of the procedures to accomplish these tasks.

Student notes

Directions for loading the Hear and Spell program from a cassette recorder and a listing of those programs. The disk-loading procedure for the QUIZ and TUTOR programs is also explained, and there is a listing of the QUIZ programs currently available to the student. General instructions for computer access are also included.

Implementation

Course usage: Biology 128-129

Number of student users: 180(to Spring 1982)

Student time spent using materials: (hours/student/week) A total of 374 hours/3 week period for all students

Paul F. Calgher,
Foothill College
12345 El Monte Road
Los Altos Hills, CA 94022
(415) 948-8590

Description of Materials

QUIZ-DRILL: BIOCHEMICAL TERMS AND CONCEPTS

These programs have as their intended use the reinforcement via a repetitive drill mode of the extensive terminology and conceptualizations encountered in a first biochemistry course for Allied Health Students. The questions are based on the text: Kilgour, Fundamentals of Biochemistry, Van Nostrand.

Before attempting the quiz drills, students should have prior courses in elementary inorganic and organic chemistry.

Authors

Paul F. Calgher, Foothill College
R. D. Allison (Modification of original)
B. C. Manfred Huechel, Foothill College

Technical Description

Programs are written in BASIC for use on an HP-2000 time sharing system. This system has a 24 megabyte Disk Storage Unit.

Instructor Notes

These quiz drills should be used to demonstrate and reinforce the terms and concepts presented in standard elementary biochemistry courses (college level). The execution of the programs usually requires 3 half-hour sessions at the terminal for the average student to attain the sought-after raw score of 20.

Presentation of lecture material and assigned reading in the text is recommended prior to CAI.

Student Notes

Instructions to the student refer to procedures for getting on the system, how the programs work (as far as the student/user is concerned) and what part the computer quizzes will play in the student's grade.

Implementation

Course usage: Chem 10 (Intro College Chem)
Chem 52 (Elem BioChem for Allied Health Students

Number of student users: 40

Student time spent using materials: 1½ hours/week

Note: The single greatest advantage that came about as a result of usage of the quiz drill programs was that they allowed me to move at a far greater rate because I didn't have to use up nearly so much class time on elementary terms and concepts.

Ernestine W. Camp
900 Fallon Street
Laney College
Oakland, CA 94605
(415) 834-5740

Description of Materials

Metric Conversions:

This program is a drill and tutorial in metric conversions. It is designed for use by students enrolled in basic math or science classes. Students should know the metric units of length and their abbreviations before using the program. Use time is variable.

Author

Ernestine W. Camp

Technical Description

Program METRIC CONVERSIONS is written in Apple Integer BASIC using a 3.3 disk operating system. It uses 36 sectors of disk storage.

A special character set is used which may be removed, if necessary, by typing 80 GOTO 400. L$ statements have been used in place of CALL-936 for the clear screen command.

Instructor Notes

Instructor notes describe the tutorial and drill parts of the program individually. The instructor is advised that student users will be given 5 problems along with multiple-choice responses and then the option to stop, get help, or continue. A correct response results in presentation of a new problem while an incorrect response results in presentation of the conversion rule before a new problem is given.

Inappropriate student input causes the message RETYPE LINE to appear. After several such errors, the program aborts. It may be restarted with the RUN command.

Student Notes

Student notes include general program information (as described above) and step-by-step directions for using the program.

Implementation

Course usage: Basic Arithmetic

Number of student users: 22

Student time spent using materials: ½ hour
(hours/student/week)

Robert Christie
Miami-Dade Community College
4011 SW 104th Street
Miami, FL 33176

Description of materials

Package: A series of introductory algebra programs purchased from Ohlone College.

Programs:

ALG 6	ALG 10-18
ALG 7	ALG 21
ALG 9	ALG 22

These programs are designed for use by college students enrolled in introductory algebra classes. Students should have a background in basic arithmetic. These programs should be used to demonstrate concepts covered in classroom lectures and the textbook, and to provide drill and practice. Students should plan to denote a minimum of 2 or 3 30-minute sessions running each program.

Author

Ron Staszkow, Ohlone College
42600 Mission Blvd.
Freemont, CA 94530

Modified by: Robert Christe and
V. Francisco Arteaga
Miami-Dade Community College

Technical Description

The programs have been modified to run on DEC PDP 11/60 using the RSTS/E operating system and DEC BASIC PLUS language. The programs are approximately 400-500 statements in length and require approximately 20 blocks of disk storage per program.

Student Notes

These instructions state the purpose of the programs and encourage students to use them for drill and practice of concepts covered in class. Instructions are then given for gaining access to the system and running the math programs.

Implementation

Course usage: Math 1024

Number of Student Users: 100 (anticipated)

Student time spent using materials: Math 1024-30 minutes
(hours/student/week)

John Clifton
El Centro Community College
Main & Lamar Streets
Dallas, TX 75202
(214) 746-2387

Description of materials

Program: FRACTION

This program is used as a review following coursework on fractions. A problem is presented to the students, they work the problem, and then check their results with those given by the program.

Students may also present a problem to the computer and then check their results with those of the computer.

Author

John Clifton

Technical Description

This program runs on a TRS-80 Model III and is written in Disk BASIC.

Implementation

No data provided

Maurice Deutsch
Los Angeles Valley College
5800 Fulton Avenue
Van Nuys, CA 91401
(213) 781-1200

Description of materials

Program: SIMEQN

The purpose of this program is to aid in simple truss force analysis and design. It can be used to solve simultaneous equations and is therefore appropriate for use in a college-level engineering mechanics course. Students should have some background in matrix algebra and physics.

The program should be used to enrich textbook treatment of force analysis of trusses. Students should plan to devote a minimum of one 3 hour session to running the program.

Author

Maurice Deutsch, alterations and adaptations
Andy Roth, CCG., original source

Techincal description

The program is written in Honeywell's TSS BASIC and runs on a Honeywell 6000 mainframe computer. The program is approximately 167 statements in length and requires 4 little links of user core area for a 12-variable, 12-system solution and 3 little links each of disk storage for 2 data files.

Implementation

Course usage: Engineering Mechanics - Statics

Number of student users: 4 (as of March 1982)

Student time spent using materials: One 3 hour session (One time only)
(hours/student/week)

Note: It was possible to cover previously untreated subjects and concepts and allowed for analysis and reduction of data which illuminated concepts.

Sharon Edgmon
Bakersfield College - Downtown Center
2101 K Street Mall
Bakersfield, CA 93301
(805) 395-4375

Description of Materials
Program EXPNT1

This program gives practice and instruction in the evaluation of problems of the type: A^M (where A is greater than or equal to zero and M is greater than or equal to one, and A and M are whole numbers).

The program is designed for use by college students enrolled in a basic arithmetic/ algebra course which includes the topic of evaluating exponential expressions.

This program should be used as an adjunct to lessons on exponential notation and evaluating exponential notation and evaluating exponential expressions. Students should spend approximately 15-30 minutes running this program.

Authors

Sharon Edgmon
Olin Kirkland

Technical description

The program was written in BASIC plus to run on a DEC PDP 11/70 under RSTS/E version 7 operating system.

Instructor Notes

These notes inform the instructor of the purpose and range of the program. The two sections of the program are described and the students options for answering the problem are explained. Finally, it is noted that an incorrect response will result in a demonstration of how to do the problem correctly.

Student Notes

The student notes explain the purpose of the program and advise the student that incorrect responses will be evaluated and the problem will be worked correctly, showing the student where the error was made.

Package: Ohlone College DVM (Developmental Mathematics) and ALG (Elementary Algebra) programs

These programs,useful as both drill and instructional tools, present math problems to be solved by the student; reinforce correct solutions; and, if incorrect responses are given by the student, will often demonstrate the correct procedure and give mini-lessons regarding the theory involved.

Authors

Programs adapted by Olin Kirkland and Sharon Edgmon
Original Source: Ron Staszkow
Ohlone College
Freemont, CA

Technical description

The programs were originally written in a version of BASIC to run on a Hewlett-Packard computer. They have been adapted to run on a DEC PDP 11/70 under the RSTS/E Version 7 Operating System.

Implementation

Course usage: Math 260 (Basic Arithmetic)
Math 200A (Elementary Algebra)
Math 200D (Intermediate Algebra)

Number of Student Users - 300 per semester

Student time spent using materials: 15-90 minutes
(hours/student/week)

James David Flanagan
Central Piedmont Community College
P. O. Box 35009
Charlotte, NC 28235
(704) 373-6547

Description of materials

Package: BSOC

This is a group of 6 programs designed for use by self-paced first and second year sociology students. They are intended to help students prepare for self-paced unit tests which are administered on demand. The design of the programs makes it possible, with minimal changes, for them to be used in any subject area. It is necessary for each student to have a floppy diskette.

Program: BSOC.SM

This booting program is a straightforward menu program which allows the student/user to select any of the other programs in the system.

Program: BSOC.SO
Provides the student/user with a list of objectives for the chapter chosen by the student/user.

Program: BSOC.SQ

Provides the student user with a list of key questions related to objectives for any chapter she/he chooses.

Program: BSOC.SC

Provides the student user with a glossary of the important concepts as related to the objectives for any chapter chosen.

Program: BSOC.PT

Produces a test of 10 randomly chosen questions, gives hints, keeps score, produces a summary of answers, and records the score for any chapter the student/user chooses.

Program: BSOC. SG

Provides the student/user with a list of test scores earned by the student/user.

These programs should be used by 1st and 2nd year college students in a self-paced sociology course using Ian Robertson's, Sociology, 2nd edition as their text. The objectives and test questions are derived from this text. The practice tests produced by BSOC are an integral part in the completion of the course. Students should plan to devote a minimum of one half hour per chapter when using the programs.

Authors

J. David Flanagan
Dail Frye, Student Assistant

Technical Description

BSOC is written in Applesoft BASIC and runs on an Apple II Plus or Apple II with Applesoft in ROM, with 48K of memory and a disk drive using DOS 3.3.

The 6 programs that make up B80C vary in length from 1362 bytes to 8423 bytes and use a maximum of 12K of user memory. The text files occupy approximately 75 sectors of disk space per chapter.

The programs make use of several non-standard printing formats to enhance screen display. The screen display subroutine begins at line 2000 of the programs. As a result, a printer cannot be used with the programs.

Instructor Notes

The instructor notes advise that, as presently written, BSOC is based on Ian Robertson's Sociology, 2nd edition, text. The notes explain the structure of the programs, how they work, what will be required of student/users, and how the instructor can use the grade recording program to assess the students' progress.

Student Notes

The student notes include instructions for using the BSOC programs and in Apple II microcomputer.

Implementation

Course usage: (1) Introduction to Sociology
(2) Group Interaction

Number of student users: 95 (Spring 1982)

Student time spent using materials: (1) one 1-hour session
(hours/student/week) (2) one 20-minute session

Gregory L. Goodwin
6503 Mt. Hood Drive
Bakersfield, CA 93309
(805) 834-0307

Description of Materials

Package: Government

This is a group of 9 tutorial/quizzes that cover and supplement the material in the first half of the text used in an introductory political science course.

Each lesson consists of 20-30 questions and each question has 4 or 5 possible answers. To this extent it is like a multiple choice test, with the additional feature that each response has comments built in, giving hints. Often the student is given another chance to select the correct answer. Students may also offer their own comments during the lesson.These are available for later review by the instructor.

Author

Gregory Goodwin

Technical Description

The programs are written in DECAL, an authoring language implemented on the Digital Equipment Corporation PDP 11/70 computer running under the RSTS operating system.

Implementation

Course usage: Political Science I - American Government

Number of student users: 56 (Fall 1981)

Student time spent using materials: No data available
(hours/student/week)

Nelson Greene
Delta College
University Center, MI 48710
(517) 686-0400

Description of materials

Program: MEDTM1

This program is designed to be used by students starting any college level allied health curriculum. It requires no previous background and would be best utilized for review purposes. The program includes common medical prefixes, suffixes, and combining forms. It is suggested that students spend approximately 20 minutes at the end of each unit running the program.

The program may be modified and used as a weekly quiz. The program will keep track of the students' scores.

Technical description

Program MEDTM1 is written in DEC BASIC PLUS and runs on a DEC PDP 11/50 under the RSTS/E Version 7.1 Operating System.

Authors

Nelson Greene - Adaption
R. D. Allison - Original Program

Allan Gubrud
Lane Community College
4000 E. 30th Avenue
Eugene, OR 97405
(503) 747-4501

Description of materials

A course entitled "Computer Aided Energy Analysis and Design" was developed and taught for the first time in the winter quarter, 1982. Microcomputers, using purchased software, were used by students for many of the calculations required during the course.

Authors

Not reported.

Technical Description

Apple II plus microcomputers with 2 disk drives each.

Implementation

Course usage: Computer Aided Energy Analysis and Design

Number of student users: 23 (winter 1982)

Student time spent using materials: No data available
(hours/student/week)

Rita D. Haberlin
College of Alameda
555 Atlantic Avenue
Alameda, CA 94501
(415) 522-7221

Description of Materials

GLACIATION

An instructional package of 6 computer programs to provide supplementary drills and exercises on glaciers and glaciated landform.

This instructional package is designed for use by college students in an introductory geology or physical geography course. Students should have completed lectures and readings on glaciation before using these programs.

The 6 programs in this package are:

GLACIATION TUTORIAL - presents key concepts followed by questions using high resolution graphic diagrams.
GLACIER TERMS - definition or description given, student responds with correct term.
MATCHING QUIZ - ALPINE - students match short one or two word descriptions to alpine glacial landscape features.
MATCHING QUIZ -CONTINENTAL - students match short descriptions to continental glacial features.
MATCHING QUIZ - POTPOURRI - requires matching a variety of glacial festures to their descriptions.
IGNEOUS FEATURES - An instructional package of 6 computer programs to provide supplementary drills and exercises on igneous rocks and igneous features. The package is designed for use by college students in an introductory geology or physical geography course. Students should have completed lectures and readings in this topic before using these programs.

The 6 programs in this package are:

IGNEOUS FEATURES - This program provides visual recognition and review of the characteristic volcanic and intrusive igneous features.
IGNEOUS ROCKS IDENTIFICATION - A lab simulation tutorial to help identify igneous rocks.
MATCHING QUIZ - LAVA TYPES - Various types of lava are to be matched with such characteristic features as composition and physical appearance.
MATCHING QUIZ - FEATURES - Students match volcanic features w/various locations where these features can be found.
TRUE OR FALSE QUIZ - Students are provided with 20 statements dealing with extrusive and intrusive igneous features.
BINGO - Questions are asked in a completion type format. Each correct response fills a square in a bingo card.

Authors

Rita D. Haberlin
Patricia A. Kilda

Technical Description

All programs were written in Applesoft BASIC on a 48K Apple II computer using a 3.3 DOS. Color illustrations were drawn on an Apple Graphics Tablet: The programs are approximately 6K in length and make use of Apple's color graphics capabilities. Page 1 of high resolution (HGR) is used for the GLACIATION package.

Recommended Usage

These programs should be used for drill and practice quizzes covering concepts discussed in lectures or covered in texts. The "Igneous Rocks Identification" program might be used as a substitute for a lab on this topic. Students should plan to devote about 20 minutes per program or about 2 hours to run the entire diskette.

Instructions

The user is instructed in use and care of the equipment and how to start, change and stop the programs.

Implementation

Course usage: Introduction to Geology, Physical Geography

Number of Student users: 30 (Spring 1982)

Student time spent using materials: 1 hr.
(hours/student/week)

Note: GLACIER TERMS is an adaptation of surveying terms by Robert D. Allison
Bakersfield College

BINGO is an adaptation of Multiplication
BINGO by Russ Bayley and Bill Wallquist
San Mateo County
333 Main St.
Redwood City, CA 94603

William C. Henderson
College of Alameda
555 Atlantic Avenue
Alameda, CA 94501
(415) 522-7221

Description of materials

Package: PSYLAB

This is an operant conditioning question exercise program, developed as a tutorial drill for the course, Psychology 4 (Conditioning and Learning). There are 20 modules of instruction in the course, each of which is paralleled by a CAI lesson. PSYLAB provides exercises over the sets of study objectives for each of the course's 20 Mastery Units.

There are 7 programs in the package:

MENU - User access program
UNIT - File initializing program
NAME - Student name entry program
GRADEM - Grade entry program
PRINTR - Prints grades to screen or printer
ENTER -(Entry of questions and answers for lessons)
PSYLAB-Drill-quiz program.

Authors

Bill Henderson (these programs based on modifications of R. D. Allison's
R. D. Allison SURDEF program)

John Hince - developed the ENTER program and helped with the translations from DEC BASIC to TRS-80 BASIC

Technical description

Written in TRS80 Model III BASIC

Implementation

Because these materials are not scheduled for use before mid-April 1982, subsequent to this report, no student usage data are available.

Jim Kennedy
Phoenix College
1202 W. Thomas Rd.
Phoenix, AZ 85013
(602) 264-2492

Description of materials

A tutorial unit on cellular respiration on the TICCIT system at Phoenix College.

Authors:

Jim Kennedy
Jim Hughes

Technical Description

The material is being written for the TICCIT (Time shared Interactive Computer Controlled Information Television) system at Phoenix College. The language is TAL(TICCIT Authoring Language)

Implementation

Course usage: General Biology

Number of student users: Material was still not being used with students at the time of this report.

James T. Knowles
North Lake College
2000 Walnut Hill
Irving, Texas 75062
(214) 659-5258

Description of Materials

Program: PHYSLAW "L"

Used to review the laws of physics studied in the first semester of a two-semester physics course. The program should be used at the end of the first semester as a review for the final or at the beginning of the second semester as a review of the first semester material. Students should allow 15 minutes for this program.

Program: PHYSUNITS "U"

Review of the physical quantities, their SI units, and whether they are on a vector or scalar quantity. This program may be used at any point in either semester by adapting the data to the appropriate material. As written, it is a review of first semester material. Students should plan to spend approximately one-half hour on this program.

Program: PHYSHW "H"

Presents a sample of typical homework problems which are similar to problems that will be encountered on a test. Prior to using this program, students should have covered the appropriate materials in lecture and lab.

The program is used as homework or test preparation. It assumes the student has covered the associated materials in lecture/lab and has worked homework problems from the text. It will require 1-3 hours of student time to do the 8-12 problems in each set.

Author

James T. Knowles - Adapted from a program by R. D. Allison

Technical Description

These programs are written in TRS-80 Model III BASIC using a 16K memory. PHYSLAW "L" and PHYSUNITS "U" each use approximately 40% of the memory and are each about 220 statements long. PHYSHW "H" between 70% and 95% of the memory and is approximately 300 statements long.

Instructor Notes:

These notes explain the purpose of each program and how they work. The notes explain what is expected of the student/user and how the program responds to correct and incorrect responses. Instructions for adaptation to other systems are given and ideas for use in other areas.

Student Notes

These instructions guide the first time computer user through the steps for using the computer. The purpose of the programs, the prerequisites, and the options that will be presented during actual problem solving are then explained.

Implementation

Courses Usage - Phys 111, Phys 112, Phys 202

Number of student users: 25

Student time spent using materials: (hours/student/week)	Phys 111 - 2 hrs. Phys 112 - 2 hrs. Phys 202 - 1 hr.

Notes:

Improvement in calculation accuracy and improvement in problem solving techniques as measured by improved scores on tests were noted on the part of the students as a result of implementation of these programs.

Tim P. Larson
24389 Avenue 120
Porterville, CA 93257
(209) 781-2719

Description of materials

A Tutorial for: Intro to Comp Sci

This program utilizes 18 question files. A KEY.FIL (student names and identification numbers) is necessary to run the program. The tutorial is a review of the 18 chapters covered in an Introduction to Computer Science course. (Text: Madell, Computers and Data Processing, 1979)

The tutorial is menu driven and interactive. It contains multiple choice and true/false items. The package includes a series of 5 programs (MENUSVAR, INITLVAR, NAMESVAR, GRADEVAR, and PRINTVAR) that interact for class records management.

The programs are written in MICROSOFT BASIC, Extended Disk, Version 5.20(c)1980.

Implementation

Course usage: Computer Science 30

Number of student users: 40

Student time spent using materials: No data available
(hours/student/week)

Don Low
Orange Coast College
2701 Fairview Road
Costa Mesa, CA 92626
(714) 556-5651

Description of materials

The program is a series of interactive exercises that are designed to develop a decision-making consciousness in the individual and at the same time teach an objective process that can be useful in making major decisions.

Note: The program is written but has not been implemented on a computer yet. It is expected to be used in Fall '82.

Dennis Mitchell
Department of Chemistry
Los Angeles City College
855 N. Vermont Avenue
Los Angeles, CA 90029
(213) 663-9141

Description of materials

Program: SIGFIG

This program instructs the student in the determination of the number of significant figures in any number as well as calculating the answer to a problem to the correct number of significant figures.

It is designed for use by college students in beginning chemistry and physics courses. The program should be used when the course topic is significant figures or it can be used any time as a review by the student. The running time depends on the parts of the program the student wishes to run, but could be as long as one hour. The student is allowed to quit at most any time. The student will have to use a calculator.

Program: CRT

The program CRT explains the principles of the cathode ray tube and demonstrates how it functions. It is designed to be used by college level students in the introductory or general chemistry courses. One of the topics of these courses is the nature of elementary particles and the cathode ray tube demonstrates the properties of the electron. The student is allowed a great degree of control over the flow of the program.

The program should be used when the course topic is the nature of elementary particles. The running time depends on the student and may be as little as 10 minutes.

Author

Dennis Mitchell

Technical Description

These programs are written in Applesoft BASIC. They require one disk drive and 48K of memory. Remark statements should not be included in the SIGFIG program when stored on disk because it may cause the program to exceed 48K. CRT requires the use of an exec file so that the program will be stored above the graphics memory region, rather than running into that region.

Instructor Notes

These notes include a description of the program. The instructor is informed of exactly what the program does and how it runs. Hints and suggestions are given for transferring the programs to other systems.

Student Notes

The student is instructed in the care, handling and use of diskettes and informed that the program, once running, will provide all necessary further instructions. The student is also advised that her name, course number, and quiz results will be automatically recorded at the end of the program.

Implementation

Course usage: Chemistry 1
Chemistry 11
Chemistry 22

Number of student users: 1

Student time spend using materials: (hours/student/week) N/A (depends on how long student choosed to run the program)

Notes: Actually not had a chance to use these programs yet.

Marilee Murray
2502 E. LaMar Road
Phoenix, AZ 85016
(602) 955-7627

Description of Materials

Because of equipment difficulties, no materials have been produced to date. However, the following programs are in the process of development or are planned for the near future.

- Remedial tutorial on metric system
- Class management system
- Inventory package
- Materials for individualization of the preparatory chemistry course.

T. J. Overley
Scottsdale Community College
9000 E. Chaparral Rd.
Scottsdale, Arizona 85253
(602) 941-0999

Description of Materials

A tutorial program on graphing quadratic functions. The tutorial is divided into 9 units as follows:

1) Identification and Definition of Quadratic Function
2) Preview of Graphing
3) Finding the Vertex
4) Finding the Line of Symmetry
5) Finding the Image of a Second Point
6) Drawing the Graph
7) Finding the X-Intercept(s)
8) Finding the Y-Intercept
9) Quiz

Author

T. J. Overley and efforts of student programmers

Technical Description

The program is designed for a 48K Apple, uses one disk drive and is written in Applesoft BASIC. The high resolution character generator has been used to create exponents, absolute value signs and other standard mathematical symbols. Text windowing is used to avoid restriction of text to the standard four lines at the bottom of the screen when the high resolution graphics are used.

Implementation

Material has not been used by students yet.

Philip James Poli
Brookdale Community
Newman Springs Rd.
Lincroft, New Jersy
(201) 842-1900

Description of materials

This is a Computer Managed Instruction (CMI) package. It consists of a number of programs designed to create and maintain student records and files. This CMI package can be divided into four categories.

(1) Initiation
- INITN - Creates name, social security number and ID fields
- INITQ - Creates quiz fields
- INITT - Creates test fields
- INITL - Creates laboratory fields

(2) Input
- NAMER - Allows entry of student name, social security number, and ID code
- DUPER - Provides for duplication of all or part of the files
- GRADER- Allows for entry of test, quiz and lab grades and updates records

(3) Output
- LISTN - Lists student name, social security number and ID
- LISTQ - Lists quiz grades with appropriate student name
- LISTT - Lists test grades with appropriate student name
- LISTL - Lists lab grades with appropriate student name
- FINAL - Generates final, weighted grade averages for all students. The grades are displayed both in numerical and letter form.
- PRINTER - Generates one complete record of all the information for each student.

(4) Diagnostics - Correlate student performance with the class performance as a whole.
- CAUTN - Generates "danger points" accumulated by the student during the semester. If a certain number of points is reached, the student is no longer eligible for successful grade completion.
- TOTALS - Produces a breakdown of final grade percentages and produces a histogram of these results. It also includes the class average.

Author

Philip J. Poli

Technical Description

Programs are written in BASIC

Implementation

No data provided.

C. D. Shelton
East Los Angeles College
1301 Brooklyn Avenue
Monterey Park, CA 91754
(213) 265-8885

Description of materials

Programs: PROBI, PI, PROB2.PI

These programs present sample problems of single event and multiple event probability, illustrating probability rules and laws. They are designed for use by college students enrolled in General Biology and other courses which deal with genetic laws and probability models. An extensive background in math is not required to use this program.

These programs should be used to demonstrate the fundamental laws of probability which support Hardy-Weinberg and genetic laws, and to illustrate the concepts of chance, as covered in classroom lecture, textbook reading and laboratory usage. Students should plan to devote a minimum of 2 half-hour sessions to running the programs.

Author

C. D. Shelton,
East Los Angeles City College
(parts are adapted from Genetics "The Thread of Life")

Technical description

These programs are written in OMSI Pilot-73 and then translated into DEC BASIC-PLUS and runs on the DEC PDP 11/70 under the RSTS/E Version 7 Operating System. The program is approximately 400 statements in length and requires an 8K user core area.

Student notes

A student handout will include a step by step description of:

1) How to get on the system.
2) A sample run of the program.
3) Some simple operational steps for running the program.
4) How to get off the system.
5) A study guide with some study questions.

Instructor notes

These will include a program listing and a sample run with some comments on implementation on other systems.

Implementation

Course usage: Geology 3, Biology 7

Number of student users: 150 (Spring 1982) (Apparently anticipated)
Student time spent using materials: 30 minutes
(hours/student/week)

Robert O. Wickey
Bakersfield College
1801 Panorama Drive
Bakersfield, CA 93305
(805) 395-4224

Description of materials

Purpose: To establich a computerized TUTOR/QUIZ Chemistry system by incorporating the 8300+ questions of the CSU-SOCRATES chemistry date bank into the BC-RQG/TSTGEN system.

Abstract: The cyber system chemistry data base of the SOCRATES test generator as used by the California State University system has been translated into DEC PDP 11/70 compatible language and is now available for use in the Bakersfield College test generator program (TSTGEN) using the random test question generator routine (RQG). Thus far, approximately 250 of the CSU questions have been edited for TSTGEN use and work continues on the balance. Eventually all applicable questions will be available which should serve as a large beginning base for additional question input.

Future Possibilities:

1. Use of the Bakersfield College program for on-line video testing and grading (QUIZEM,QUIZYA). This may require additional programming to allow hard-copy and Control C traps.
2. Incorporating the Bakersfield College "ESSAY" program for subjective testing.
3. Do additional work on the MATCHING feature of TSTGEN.
4. Set up a single terminal in SE-28 for controlled testing.
5. Compose large tests to use for randomized MID-TERMS.
6. Add graphics capabilities to test generation, esp. use of "GIGI"
7. Attempt to do some kind of enlargement of hardcopy output so that overhead transparencies are visually more acute.

Details: Specific procedural details for using program "TSTGEN" to create a test are to be found in the BGICC revised document titled "RANDOM QUESTION TEST GENERATOR".

Authors

Robert O. Wickey
Olin C. Kirkland

Technical Description

Program written in BASIC PLUS and implemented on a Digital Equipment Corp. PDP 11/70 computer.

Implementation

The system is to be used for the first time in Fall 1982.

Nan Wilson
Business and Economics Division
Johnson County Community College
12345 College Blvd.
Overland Park, KS 66210
(913) 88-8500

Description of Materials

A series of drill and simulation exercises has been developed for courses in Basic Economics and Microeconomics that correlate with textbooks written by Long (Introduction to Economics) and McConnell (Economics, 8th ed.). High resolution graphics are used to display a graph of supply and demand functions. These programs are intended for the use of first and second year college students.

The programs currently in use are:

DEFINITIONS - common terms used in economics

SUPPLY/DEMAND - effect of changes in supply and demand on price and quantity

COMPETITION - determining output level in a competitive firm

MONOPOLY - determining output level in a monopolistic firm

LAWS - anti-trust and labor legislation

FED - Information about the Federal Reserve System and monetary policy

POLICY - government policy simulation

BALANCE - balance of payments and balance of trade

MICROTERMS - definitions of terms

COSTS - definitions of production terms

OUTPUT - determination of output level in a competitive firm

OUTPUT2 - determination of output level in a monopolistic firm

OLIGOPOLY - decision making simulation in noncollusive oligopoly

INPUT - determination of number of workers to hire in competitive product and resource markets

INPUT2 - determination of number of workers to hire in bilateral monopoly

AUTHORS

Not mentioned in report

Technical Description

The exercises were programmed in Applesoft BASIC and run on Apple II Microcomputers.

Implementation

Course usage: Basic Economics, Micro & Maco Economics

Number of student users - 100

Student time spent using materials: 20min/wk
(hours/student/week)

Kathryn Yates
Richland College
12800 Abrams
Dallas, TX 75243
(214) 746-4596

Description of Material

CIVILDRL: A quiz for American Government students based on James D. Barber's Text, Presidential Character

The program is designed to administer 10 quizzes with 10 questions each (either number easily changed) to students enrolled in virtually any course requiring multiple choice tests over conceptual or factual material.

Author

Kathryn Yates - Program adapted from ICCC Workshop Material

Technical Description

The program CIVILDRL is written in disk BASIC language and runs on an IBM personal computer using IBM DOS. The computer has a 64K word memory with two 5.25 inch disk drives and one printer. The program is approximately 152 statements in length and requires 4 brief support programs establishing the random access file for storing student data and 1 text file containing approximately 25 questions. It requires 6K user core area and approximately 31K of disk storage space for data files.

Note: In the first 2 lines of the program there are two directions unique to the IBM Personal Computer: (1) KEY I " " clears the soft keys or function keys (2) LOCATE 12,1 locates the row and column positions for the cursor.

Implementation

Course usage: Government 202

Number of Student Users - 70 (Spring 1982)

Student time spent using materials: 5-15 min/wk
(hours/student/week)

Joan Zinn
Cuyahoga Community College
2900 Community College Avenue
Cleveland,)H 44115
(216) 241-5966

Description of materials

Five short tutorials on Statics, Kinematics, Newton's Second Law, Projectile Motion, and Energy Conservation.

Author

Joan Zinn

Technical description

Not reported

Implementation

Course usage: Physics 101, Physics 121

Number of student users: 100

Student time spent using materials: Physics 101: 30-40 min/wk
(hours/student/week) Physics 121: 15-20 min/wk

Note: So far the biggest plus has been improvement on exams, especially by the poorer students.

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University of California
Los Angeles, California 90024
SEP 30 1983